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Forest Pest Management Report

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FOREST INSECT AND DISEASE SURVEY SYSTEM:
A USER'S GUIDE FOR THE SOUTHWESTERN REGION

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FOREST INSECT AND DISEASE SURVEY SYSTEM: A USER'S GUIDE FOR THE SOUTHWESTERN REGION

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INTRODUCTION

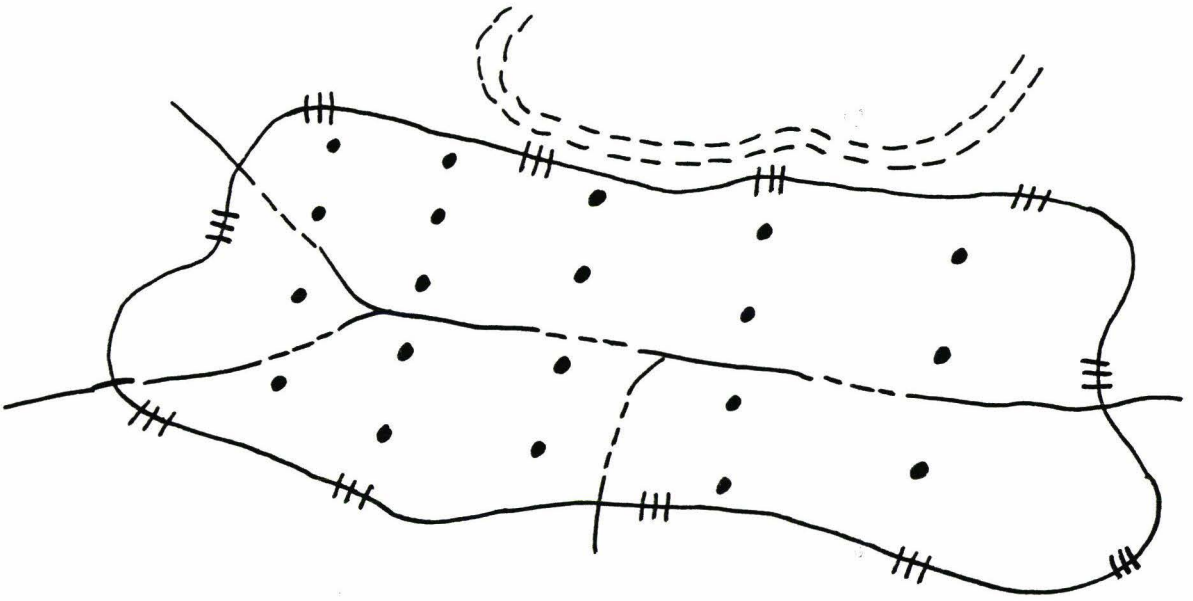
The purpose of this user's guide is to describe field data collection and recording procedures necessary to operate the Southwestern forest insect and disease computer program "INDIDS R03". Much of the material presented here is unaltered from a previous publication by Bousfield (1980) in which the original "INDIDS" computer program and survey system was described. However, this INDIDS R03 guide includes several significant changes in data collection and recording made to accommodate forest conditions in the Southwestern Region.

SURVEY TYPES

Usually, the land manager has only one specific pest in mind when conducting loss surveys. This system, however, provides for four specific pest types: (1) Bark beetles, (2) defoliators, (3) disease, and (4) other insect and miscellaneous damaging agents. Data can be collected for all four types at the same time if desired, but analyzed separately using the computer program "INDIDS" for the different options. The program provides detailed mensurational data of stands by species, size class, and damage class of designated survey type and aggregates other problems in one column. Detailed statistics on other problems can be obtained by running the option desired. Each sample tree in the survey, however, is limited to three pest problems. For example, a tree could be attacked by bark beetles, have mistletoe, and be top-killed by a defoliator. Another tree could be recorded as having moderate defoliation, be lightly top-killed, and have root rot. This flexibility allows for several alternatives in data collection and four options to summarize detailed statistics. Periodic annual increment was an option in the original "INDIDS" system; however, a height-growth model based on diameter growth by species, not yet available, in Region 3 is required before this option can be modified and included into the INDIDS R03 program.

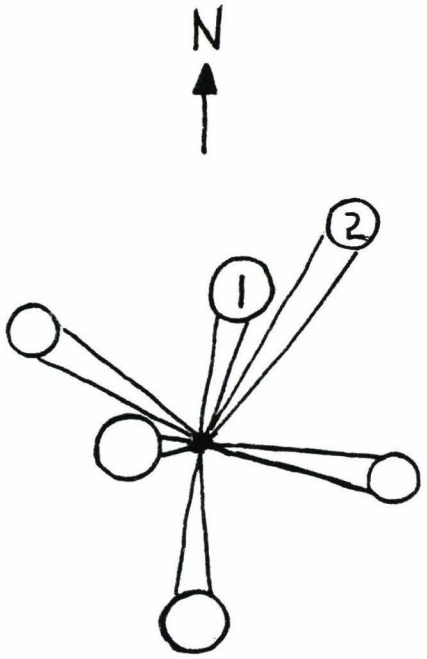
FIELD PROCEDURES

Areas examined must first be delineated into stands using standard photographic interpretation (PI) guides explained in timber management handbooks. Use existing stand delineations if the area is National Forest. Obtain either 2-inch or 2.6-inch per mile topographic maps of the area and resource photography to transfer stand boundaries to field maps. Generally, sample points on a 5- by 10-chain grid can be used to sample a stand satisfactorily. Stands less than 40 acres should be sampled with greater intensity to achieve the same sampling error. The following diagram shows how plots could be placed in a 100-acre stand.



Because of the clumped distribution of bark beetle-killed trees in a stand, sampling intensities should be greater for attacked trees than undamaged trees to obtain similar sampling errors (Freese 1962). When conducting bark beetle surveys, uninfested or undamaged tree information need only be taken on a sample of the total plots. However, in order to collect enough data necessary for volume determinations, at least 10 plots in each stand should be sampled for undamaged stand statistics. For example, if a total of 20 plots are planned for the survey, then record data on all trees within the plot on the even-numbered plots, and on the odd-numbered plots, record trees only if bark beetles have attacked or some other damaging agent is involved. Upon completion of the survey, record the number of plots in which only unattacked trees were recorded (columns 67-68) and the total number of plots (columns 72-74). Diameters of all trees in the plot are recorded to the nearest one-tenth of an inch. Tree heights are measured to the nearest 1 foot on a sample basis. Twenty-five percent of all trees over 5 inches d.b.h. on each plot (figure 1) are measured for height. After the number of trees have been determined, select trees clockwise from north to be measured for height. A different sampling method may be incorporated to obtain height estimates.

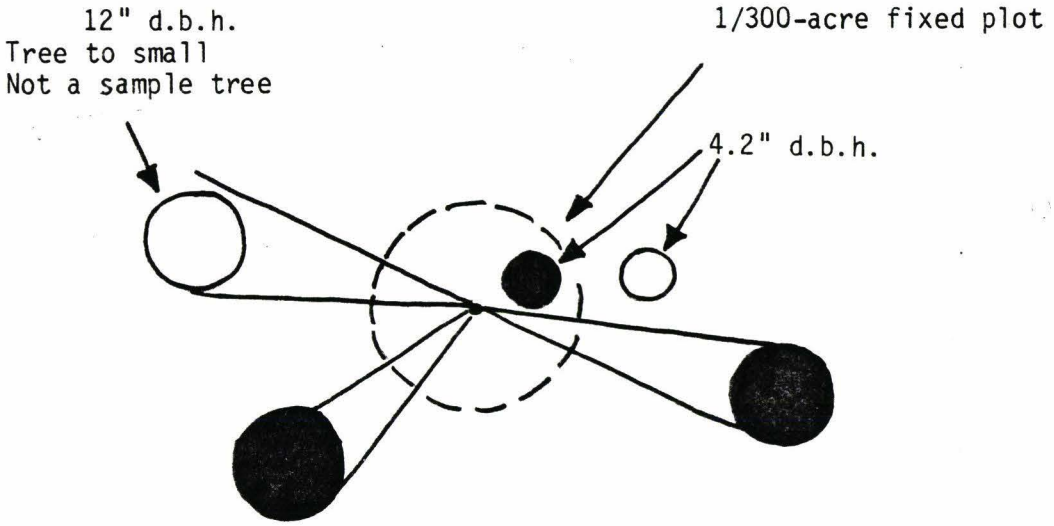
Figure 1. Height measurements of sample trees



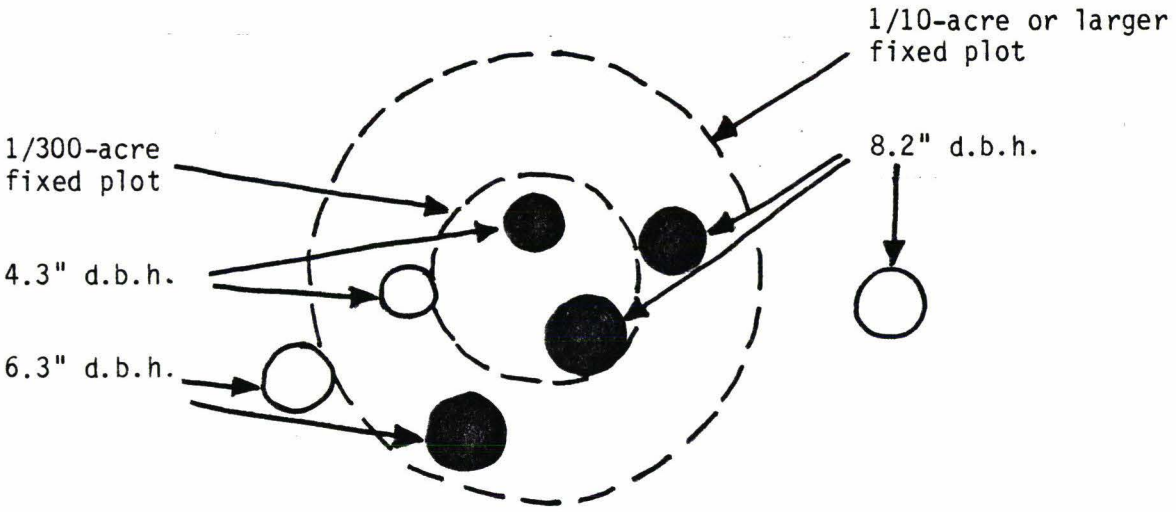
No heights are measured for trees less than 5 inches d.b.h. Regression estimates based on diameters and heights of sample trees are used to obtain heights for unmeasured trees using a log transformation of the data.

The supporting computer program "INDIDS R03" will handle both variable and fixed plot sampling including strip plots. Trees less than 5 inches d.b.h. are only sampled when they occur within a 1/300-acre or 6.8-foot radius fixed plot. All trees under 5 inches d.b.h. will be recorded on the 1/300-acre fixed plot. Trees greater than 5 inches d.b.h. are sampled from either variable plot method or fixed plot of one-tenth of an acre or larger plot. The following examples explain sample tree selection.

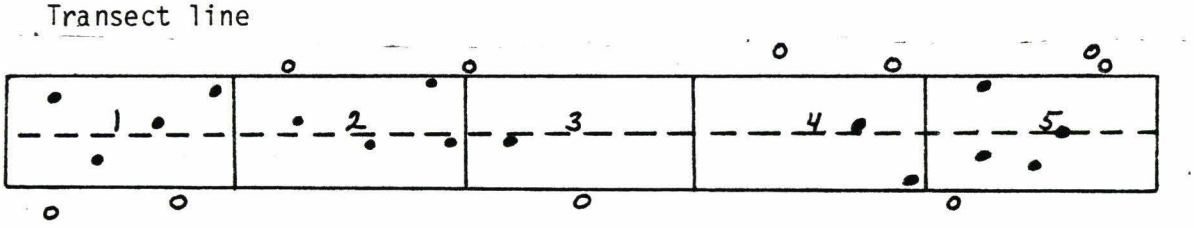
Variable plot



Fixed plot



Strip plot



● Sample trees
O Not a sample tree

INSTRUCTIONS FOR RECORDING FIELD DATA

The following is an explanation of how to record sample tree data on the field data sheet (appendix 1).

STAND INFORMATION

Forest code: Enter appropriate forest code (appendix 2). This number is used to identify the forest on which the survey was conducted and to select the appropriate volume formulas from which volume summaries will be derived.

Forest: Alpha name of Forest, Park, Indian reservation, BLM, etc. Example C A R S O N.

Stand or Area: Use compartment, subcompartment, stand number, drainage, or any combination of numeric or alpha characters that will identify the areas surveyed.

Examples 7 4 7 1 2 0 or D R Y G U L C H

Survey code		Survey type
01	=	Bark beetle survey
02	=	Defoliator survey
03	=	Disease survey
04	=	Other insect and miscellaneous damaging agents

Observers: Names or initials of observers.

Type plot: (69)

1 = Variable plot for trees ≥5 inches d.b.h. In addition, trees <5 inches are recorded on the 1/300-acre plot.

2 = Fixed plot for trees ≥5 inches d.b.h. In addition, trees <5 inches d.b.h. are recorded on the 1/300-acre plot.

Size plot: (70-71) Enter BA factor or, 1 for 1 acre, 2 for 1/2 acre, 3 for 1/3 acre, 4 for 1/4 acre, etc., fixed plots.

Example of BAF 40 would be recored as 4 0, or 1/5-acre fixed plot (either radial or strip) would be recorded as 0 5.

Undamaged tree plots: (67-68) Enter number of plots where undamaged tree data were recorded. If undamaged tree data were recorded on all plots, then undamaged tree plots would equal total plots.

Total plots: (72-74) Enter total number of plots used in sampling the stand, including undamaged stand plots. Include all plots even if some had no trees.

Date: (75-80) Enter month, day, and year.

PLOT INFORMATION

Forest code: (1-3) Same as stand information (see appendix 2).

Plot: (5-6) Plot number in sequence. Do not duplicate plot numbers within a stand. Example 0 1 for first plot.

Multiplier: (8-10) Enter the number of trees a particular record represents. This option is often desirable when numerous seedlings are present on the fixed plot. For example, if there are 16 spruce seedlings, you should record 16 in the multiplier columns, right adjusted. If you do not use the multiplier, it defaults to 1, so you can leave it blank most of the time.

Species: (12-14) Use valid species code. You can use either the alpha or numeric species code, left adjusted (appendix 3).

Examples	Douglas-fir	D F _
	Pinyon	P _ _

D.b.h. (16-18) Enter d.b.h. to nearest one-tenth inch, right adjusted. For example, a tree 12.3 inches in diameter is recorded as 1 2 3.

Height: (20-22) The height of trees sampled for height measurements is entered to the nearest foot, right adjusted.

Age: (24-26) or tree number if identity is needed. Age measurements are optional (to be added later to program).

Ten-year growth: (28-30) Last 10 years' radial growth in inches (two decimals assumed), right adjusted. Example of 1.05 inches 1 0 5

Example of .23 inches 2 3

Y-year growth: (32-34) Radial growth measurements for the period of infestation. Not less than 2 years and not to exceed the last 10 years (two decimals assumed, right adjusted) (figure 2).

X-year growth: (36-38) Radial growth measurement of the period of normal growth (two decimals assumed, right adjusted) (figure 2).

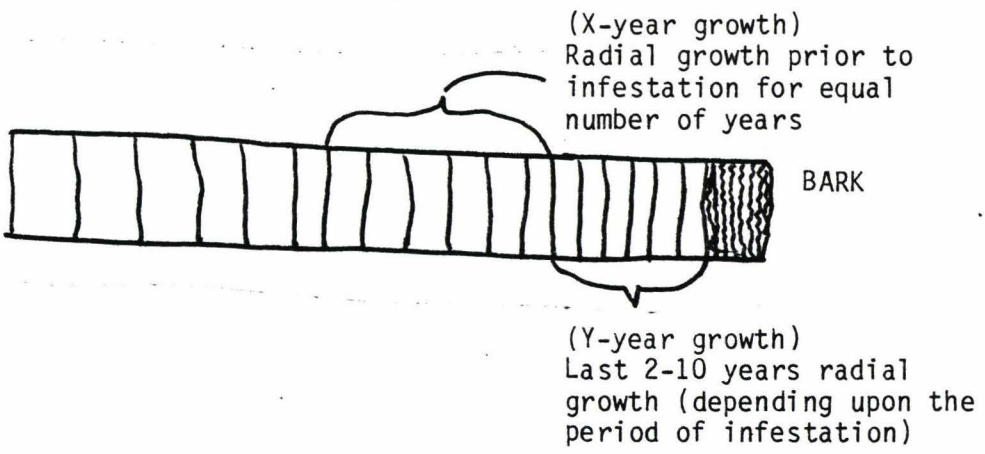
Damage code: (40-47) Examine and assign each tree an appropriate damage code. Use only valid codes as shown in appendix 4. Any combination of up to three damage codes may be used. However, if no damaging agents are found, a 0 code must be placed in column 41. When 0 is used in column 41, no other codes may follow.

COMPUTER AND OUTPUT OPERATION PROCEDURES

EDIT Program--Output

The EDIT program presents a data listing in a format similar to the field data sheets, and indicates possible errors in the listing which may be scrutinized and corrected, if necessary, prior to running the MAIN program.

Figure 2



MAIN Program--Output

For each option, INDIDS R03 MAIN computes the trees per acre (TA), basal area (BA), cubic foot volume per acre (CFV), and board foot volume per acre (BFV) for each species by damage class and four diameter classes. Percent standard error is also calculated by damage class for the stand totals. In addition, percent of stand damaged is computed in terms of trees per acre, basal area cubic foot volume, and board foot volume. Diameter of the tree of mean basal area is calculated by species and damage class. Appendix 5 shows examples of output from INDIDS R03 (EDIT and MAIN).

Operation Procedures

The following is a sequence of procedures necessary to operate the computer program INDIDS R03:

1. Key data onto disk or tape. Note: A maximum of 99 stands can be run at one time, and each stand has a limit of 400 sample trees.

Sequence of information on disk or tape file:

a. Keypunch instructions
b. First stand header information
c. First stand data input
d. 999 (columns 1-3)
e. Repeat steps a, b, and c for each additional stand
f. @ FIN

2. Load onto Harris system.
3. Edit and correct errors.
4. Transmit to Fort Collins Computer Center.
5. Receive data listing.
6. Access INDIDS R03 program through UNIVAC 1100 operating system, demand terminal.

Sequence of runstream on demand terminal:

```
@RUN,L/BΔR03JMC,10-digit run charge #,5,500
@SYMΔ[4]PRINT$.,,FCR010
@MSG,NΔGIVE TO FPM REP
@ASG,AΔFILE NAME.
@ASG,AΔR03*INDIDS.
@XQTΔR03*INDIDS.MAIN (or EDIT)
@ADDΔFILE NAME.
@FREEΔFILE NAME.
@FIN
@@TERM
```

REFERENCES

Bousfield, Wayne E. 1980. R-1 forest insect and disease damage survey system. USDA Forest Serv. Rep. R-1 79-2, revised. 23 pp.

Hawksworth, F. G. 1977. The 6-class dwarf mistletoe rating system. USDA Forest Serv. Gen. Tech. Rep. RM-48. 7 pp.

Freese, Frank. 1962. Elementary forest sampling. USDA Forest Serv. Agric. Handbook No. 237. 91 pp.

[4] Δ indicates a space

APPENDIX 1 - FOREST INSECT AND DISEASE DAMAGE SURVEY

Forest code ___ (1-3)

Forest _____ (4-19)

Slope _____ Aspect _____ Elev _____

Stand or Area _____ (20-35)

Type plot ___ (69)

Physo Site _____

Survey code ___ (36-37)

Size plot ___ (70-71)

Type _____ (38-51)

Observers _____ (52-66)

Soil _____

Green tree plots ___ (67-68)

Total plots ___ (72-74)

Date ___ (75-76) ___ (77-78) ___ (79-80)

Forest code (1-3)	Plot (5-6)	Mult. (8-10)	Species (12-14)	D.b.h. (16-18)	Height (20-22)	Age (24-26)	10-yr. growth (28-30)	y growth (32-34)	x growth (36-38)	Insect or disease (40-42)	(43-44)	codes (46-47)

CONTINUATION SHEET APPENDIX 1, continued

FOREST _____

STAND _____

FOREST INSECT AND DISEASE DAMAGE SURVEY

Forest code (1-3)	Plot (5-6)	Mult. (8-10)	Species (12-14)	D.b.h. (16-18)	Height (20-22)	Age (24-26)	10-yr. growth (28-30)	y growth (32-34)	x growth (36-38)	Insect or disease (40-41)	codes (43-44)	(46-47)

APPENDIX 2 -- FOREST CODES -- REGION 3

National Forest (NF), Indian Reservation (IR), and National Park (NP)	Code
Apache-Sitgreaves NF's, Fort Apache IR, and San Carlos Apache IR	01
Carson NF, Taos Pueblo IR, and Jicarilla Apache IR	02
Cibola NF	03
Coconino NF	04
Coronado NF	05
Gila NF	06
Kaibab NF and Grand Canyon NP	07
Lincoln NF and Mescalero Apache IR	08
Prescott NF	09
Santa Fe NF, Taos Pueblo IR, and Santa Clara Pueblo IR	10
Tonto NF	12

APPENDIX 3

SPECIES CODE

Tree species	Alpha code	Numeric code
Douglas-fir	DF	202
Aspen	ASP	746
Bristlecone pine	BCP	102
Apache pine	AP	112
Limber pine	PF	113
Southwestern white pine	SWP	114
Chihuahua pine	CHP	118
Arizona pine	ARP	135
Blackjack pine	BJP	136
Yellow pine	YP	137
White fir	WF	015
Corkbark fir	CBF	018
Subalpine fir	SAF	019
Engelmann spruce	ES	093
Blue spruce	BS	096
Arizona cypress	AC	051
Juniper	J	063
Pinyon	P	106
Cottonwood	CW	740
Other hardwoods	OH	990

APPENDIX 4

DAMAGE CODES

Code	
0	Healthy tree, no insect, disease, or damage problem
1	Unknown or natural mortality
	Bark beetles
2	Current beetle attack
3	Last year's attack
4	Older attack
5	Unsuccessful attack
6	Current strip attack
7	Older strip attack
8	Current secondary bark beetle attack
9	Older secondary bark beetle attack
	Defoliation
11	Light defoliation
12	Moderate defoliation
13	Heavy defoliation
14	Light top-kill
15	Moderate top-kill
16	Heavy top-kill
17	Defoliator-caused mortality
	Disease
20	Butt and stem decay
21	Dwarf mistletoe rating *[1]
22	Dwarf mistletoe rating *[2]
23	Dwarf mistletoe rating *[3]
24	Dwarf mistletoe rating *[4]
25	Dwarf mistletoe rating *[5]
26	Dwarf mistletoe rating *[6]
27	Root rot infected
28	Current root rot mortality
29	Older root rot mortality
30	Branch canker and stem rust
31	Stem canker

* Based on the 6-class dwarf mistletoe rating system described by Hawksworth (1977).

APPENDIX 4 (continued)

Other Insect and Damaging Problems

Code	
40	Shoot-damaging insects
41	Stem borers
42	Gall insects
43	Sucking insects (aphids and scales)
44	Webworms
45	Light winter damage
46	Moderate winter damage
47	Heavy winter damage
48	Animal damage
49	Spiketops
50	Other damaging agents

APPENDIX 5

-EDIT

INSECT AND DISEASE DAMAGE SURVEY

--HEADER CARD--

FOREST	7 KAIBAB
AREA	JACOB LAKE
TYPE SURVEY	1 BARK BEETLE
OBSERVERS	DB EET AL
GREEN PLOTS	15
SIZE PLOT	1 20
NO. PLOTS	15
DATE	2/ 1/83

--DATA--

FOREST NO.	PLOT	TREES	TREE SPECIES	DBH	HGT.	AGE	10 YR. GROWTH	Y,X YR. GROWTH		INSECT OR DISEASE			GROWTH SAMPLE
7	1	1	YP	23.8	84	0	.00	.00	.00	2	20	48	(Not functional)
7	1	1	YP	30.5	92	0	.00	.00	.00	5	13	20	
7	1	1	YP	23.1	86	0	.00	.00	.00	13	20	48	
7	1	1	YP	24.1	0	0	.00	.00	.00	13	20	0	
7	1	1	YP	21.9	0	0	.00	.00	.00	3	0	0	
7	1	1	BJP	2.0	0	0	.00	.00	.00	11	0	0	
7	1	9	BJP	.1	0	0	.00	.00	.00	0	0	0	
7	2	1	BJP	10.0	50	0	.00	.00	.00	13	20	0	
7	2	1	YP	26.4	84	0	.00	.00	.00	2	13	0	
7	2	1	YP	29.4	87	0	.00	.00	.00	2	13	0	
7	2	1	BJP	5.4	0	0	.00	.00	.00	9	0	0	
7	2	1	BJP	6.0	0	0	.00	.00	.00	6	0	0	
7	2	3	BJP	.1	0	0	.00	.00	.00	0	0	0	
*		*		*		*		*		*			*
7	7	1	YP	23.6	103	0	.00	.00	.00	0	0	0	
7	7	1	YP	28.2	109	0	.00	.00	.00	2	0	0	
7	7	1	YP	30.3	115	0	.00	.00	.00	3	0	0	
7	7	1	BJP	19.6	0	0	.00	.00	.00	13	20	0	
7	7	1	BJP	17.1	0	0	.00	.00	.00	13	20	0	
7	7	1	YP	21.5	0	0	.00	.00	.00	0	0	0	
7	7	1	YP	26.6	0	0	.00	.00	.00	0	0	0	
7	7	35	BJP	.1	0	0	.00	.00	.00	0	0	0	

ERROR ---- SUSPICIOUS NUMBER OF TREES

*		*		*		*		*		*			*
7	14	3	BJP	.1	0	0	.00	.00	.00	0	0	0	
7	15	1	YP	20.4	65	0	.00	.00	.00	20	0	0	
7	15	1	YP	25.5	82	0	.00	.00	.00	0	0	0	
7	15	1	YP	27.4	84	0	.00	.00	.00	0	0	0	
7	15	1	BJP	.9	0	0	.00	.00	.00	20	0	0	
7	15	14	BJP	.1	0	0	.00	.00	.00	0	0	0	

TOTAL RECORDS READ = 96

TOTAL NUMBER OF PLOT = 15

DEFREE R3*KAIBAB1.

DEFIN

APPENDIX 5 (continued)

BARK BEETLE SURVEY 2/ 1/83
--SPECIES TOTAL--

KAIBAB JACOB LAKE 7

DIAMETER CLASS		UNDAM. STAND	CUR. ATTACK	LAST YEAR'S ATTACK	OLDER ATTACK	UNSUC. ATTACK	CUR. STRIP ATTACK	OLDER STRIP ATTACK	CUR. SEC. ATTACK	OLDER SEC. ATTACK	OTHER I+D PROB.	OTHER DAM. AGENTS	OTHER MORT.	STAND TOTAL
	TA	2240.0	.0	.0	.0	.0	.0	.0	.0	.0	100.0	.0	.0	2340.0
0- 4.9	BA	.9	.0	.0	.0	.0	.0	.0	.0	.0	1.0	.0	.0	1.9
	TA	7.5	.0	.0	.0	.0	6.8	.0	11.6	8.4	7.5	.0	.0	41.7
	BA	2.7	.0	.0	.0	.0	1.3	.0	2.7	1.3	2.7	.0	.0	10.7
5- 8.9	CFA	38.7	.0	.0	.0	.0	14.0	.0	30.6	12.5	42.8	.0	.0	138.7
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	.0	.0	.0	.0	.0	.0	.0	2.4	.0	11.8	.0	.0	11.8
	BA	.0	.0	.0	.0	.0	.0	.0	1.3	.0	6.7	.0	.0	6.7
9-11.9	CFA	.0	.0	.0	.0	.0	.0	.0	23.5	.0	116.0	.0	.0	116.0
	BFA	.0	.0	.0	.0	.0	.0	.0	57.1	.0	279.9	.0	.0	279.9
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	7.9	3.4	3.5	1.7	.3	.0	.0	.0	.0	18.7	.0	.0	34.1
	BA	25.3	10.7	12.0	5.3	1.3	.0	.0	.0	.0	36.0	.0	.0	85.3
12 +	CFA	813.0	331.7	395.5	169.9	44.6	.0	.0	.0	.0	993.4	.0	.0	2579.7
	BFA	4440.1	1803.4	2183.7	928.7	256.0	.0	.0	.0	.0	4991.0	.0	.0	13660.7
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	2255.4	3.4	3.5	1.7	.3	6.8	.0	14.0	8.4	137.9	.0	.0	2427.6
	BA	28.9	10.7	12.0	5.3	1.3	1.3	.0	4.0	1.3	46.3	.0	.0	104.6
TOTALS	CFA	851.7	331.7	395.5	169.9	44.6	14.0	.0	54.1	12.5	1152.3	.0	.0	2834.4
	BFA	4440.1	1803.4	2183.7	928.7	256.0	.0	.0	57.1	.0	5271.0	.0	.0	13940.6
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

PERCENT STANDARD ERROR

	TA	32.3	37.3	43.3	53.5	100.0	100.0	.0	57.1	100.0	34.6	.0	.0	29.7
	BA	27.7	36.0	39.2	57.5	100.0	100.0	.0	53.5	100.0	19.4	.0	.0	6.3
TOTALS	CFA	27.2	35.4	39.3	60.3	100.0	100.0	.0	55.0	100.0	19.4	.0	.0	7.8
	BFA	26.0	35.6	38.9	61.7	100.0	.0	.0	100.0	.0	20.6	.0	.0	9.8

TA = Trees per acre
BA = Basal area
CFA = Cubic feet volume per acre
BFA = Board feet volume per acre

APAI* = Actual periodic annual increment

EPAI* = Expected periodic annual increment (PAI) cubic foot production per acre per year without damage

*Not yet functional in INDIDS R03 program

APPENDIX 5 (continued)

BARK BEETLE SURVEY 2/ 1/83
---SPECIES YP ---

KAIBAB JACOB LAKE 7

DIAMETER CLASS		UNDAM. STAND	CUR. ATTACK	LAST YEAR'S ATTACK	OLDER ATTACK	UNSUC. ATTACK	CUR. STRIP ATTACK	OLDER STRIP ATTACK	CUR. SEC. ATTACK	OLDER SEC. ATTACK	OTHER I+D PROB.	OTHER DAM. AGENTS	OTHER MORT.	STAND TOTAL
	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
0- 4.9	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5- 8.9	CFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9-11.9	CFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	6.6	3.4	2.9	1.7	.3	.0	.0	.0	.0	5.6	.0	.0	19.2
	BA	24.0	10.7	10.7	5.3	1.3	.0	.0	.0	.0	17.3	.0	.0	64.0
12 +	CFA	775.1	331.7	358.6	169.9	44.6	.0	.0	.0	.0	539.0	.0	.0	2050.4
	BFA	4286.6	1803.4	1997.8	928.7	256.0	.0	.0	.0	.0	2920.2	.0	.0	11250.5
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	6.6	3.4	2.9	1.7	.3	.0	.0	.0	.0	5.6	.0	.0	19.2
	BA	24.0	10.7	10.7	5.3	1.3	.0	.0	.0	.0	17.3	.0	.0	64.0
TOTALS	CFA	775.1	331.7	358.6	169.9	44.6	.0	.0	.0	.0	539.0	.0	.0	2050.4
	BFA	4286.6	1803.4	1997.8	928.7	256.0	.0	.0	.0	.0	2920.2	.0	.0	11250.5
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

APPENDIX 5 (continued)

DIAMETER OF THE TREE OF MEAN BASAL AREA BY DAMAGE CLASS 2/ 1/83

KAIBAB JACOB LAKE 7

SPECIES	UNDAM. STAND	CUR. ATTACK	LAST YEAR'S ATTACK	OLDER ATTACK	UNSUC. ATTACK	CUR. STRIP ATTACK	OLDER STRIP ATTACK	CUR. SEC. ATTACK	OLDER SEC. ATTACK	OTHER I+D PROB.	OTHER DAM. AGENTS	OTHER MORT.	STAND TOTAL
DF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
ASP	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BCP	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AP	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
PF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SWP	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
CHP	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
ARP	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BJP	.6	.0	20.0	.0	.0	6.0	.0	7.2	5.4	6.3	.0	.0	1.8
YP	25.7	23.9	25.8	24.3	30.5	.0	.0	.0	.0	23.9	.0	.0	24.8
WF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
CBF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SAF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
ES	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BS	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AC	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
J	1.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.9
P	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
CW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
OH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	1.5	23.9	24.9	24.3	30.5	6.0	.0	7.2	5.4	7.8	.0	.0	2.8

APPENDIX 5 (continued)

BARK BEETLE SURVEY 2/ 1/83
--SPECIES TOTAL--

KAIBAB JACOB LAKE 7

DIAMETER CLASS		UNDAM. STAND	CUR. ATTACK	LAST YEAR'S ATTACK	OLDER ATTACK	UNSUC. ATTACK	CUR. STRIP ATTACK	OLDER STRIP ATTACK	CUR. SEC. ATTACK	OLDER SEC. ATTACK	OTHER I+D PROB.	OTHER DAM. AGENTS	OTHER MORT.	STAND TOTAL
0- 2.9	TA	280.0	.0	.0	.0	.0	.0	.0	.0	.0	100.0	.0	.0	380.0
	BA	.9	.0	.0	.0	.0	.0	.0	.0	.0	1.0	.0	.0	1.9
3- 4.9	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5- 6.9	TA	.0	.0	.0	.0	.0	6.8	.0	11.6	8.4	.0	.0	.0	26.7
	BA	.0	.0	.0	.0	.0	1.3	.0	2.7	1.3	.0	.0	.0	5.3
	CFA	.0	.0	.0	.0	.0	14.0	.0	30.6	12.5	.0	.0	.0	57.1
7- 8.9	TA	7.5	.0	.0	.0	.0	.0	.0	.0	.0	7.5	.0	.0	14.9
	BA	2.7	.0	.0	.0	.0	.0	.0	.0	.0	2.7	.0	.0	5.3
	CFA	38.7	.0	.0	.0	.0	.0	.0	.0	.0	42.8	.0	.0	81.6
9-10.9	TA	.0	.0	.0	.0	.0	.0	.0	2.4	.0	10.0	.0	.0	10.0
	BA	.0	.0	.0	.0	.0	.0	.0	1.3	.0	5.3	.0	.0	5.3
	CFA	.0	.0	.0	.0	.0	.0	.0	23.5	.0	97.0	.0	.0	97.0
11-12.9	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.8	.0	.0	1.8
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.3	.0	.0	1.3
	CFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	19.1	.0	.0	19.1
13-14.9	TA	1.2	.0	.0	.0	.0	.0	.0	.0	.0	6.5	.0	.0	7.7
	BA	1.3	.0	.0	.0	.0	.0	.0	.0	.0	6.7	.0	.0	8.0
	CFA	37.9	.0	.0	.0	.0	.0	.0	.0	.0	140.7	.0	.0	178.6
15-16.9	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.9	.0	.0	.9
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.3	.0	.0	1.3
	CFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	28.2	.0	.0	28.2
17-18.9	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.6	.0	.0	1.6
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.7	.0	.0	2.7
	CFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	69.8	.0	.0	69.8
19 +	TA	6.6	3.4	3.5	1.7	.3	.0	.0	.0	.0	9.7	.0	.0	23.9
	BA	24.0	10.7	12.0	5.3	1.3	.0	.0	.0	.0	25.3	.0	.0	73.3
	CFA	775.1	331.7	395.5	169.9	44.6	.0	.0	.0	.0	754.7	.0	.0	2303.1
TOTALS	TA	2255.4	3.4	3.5	1.7	.3	6.8	.0	14.0	8.4	137.9	.0	.0	2427.6
	BA	29.9	10.7	12.0	5.3	1.3	1.3	.0	4.0	1.3	46.3	.0	.0	104.6
	CFA	851.7	331.7	395.5	169.9	44.6	14.0	.0	54.1	12.5	1152.3	.0	.0	2834.4

APPENDIX 5 (continued)

DEFOLIATOR SURVEY 2/ 1/83
--SPECIES TOTAL--

KAIBAB JACOB LAKE 7

DIAMETER CLASS		UNDAM. STAND	LIGHT DEF.	MOD. DEF.	HEAVY DEF.	LIGHT TOP KILL	MOD. TOP KILL	HEAVY TOP KILL	DEF. MORT.	OTHER I+D PROB.	OTHER DAM. AGENTS	OTHER MORT.	STAND TOTAL
	TA	2240.0	20.0	.0	60.0	.0	.0	.0	.0	80.0	.0	.0	2340.0
0- 4.9	BA	.9	.4	.0	.5	.0	.0	.0	.0	.5	.0	.0	1.9
	TA	7.5	.0	.0	7.5	.0	.0	.0	.0	34.2	.0	.0	41.7
	BA	2.7	.0	.0	2.7	.0	.0	.0	.0	8.0	.0	.0	10.7
5- 8.9	CFA	38.7	.0	.0	42.8	.0	.0	.0	.0	99.9	.0	.0	138.7
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	.0	.0	.0	11.8	.0	.0	.0	.0	7.2	.0	.0	11.8
	BA	.0	.0	.0	6.7	.0	.0	.0	.0	4.0	.0	.0	6.7
9-11.9	CFA	.0	.0	.0	116.0	.0	.0	.0	.0	74.8	.0	.0	116.0
	BFA	.0	.0	.0	279.9	.0	.0	.0	.0	178.2	.0	.0	279.9
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	7.9	.0	.0	16.8	.0	.0	.0	.0	19.4	.0	.0	34.1
	BA	25.3	.0	.0	30.7	.0	.0	.0	.0	48.0	.0	.0	85.3
12 +	CFA	813.0	.0	.0	840.0	.0	.0	.0	.0	1433.2	.0	.0	2579.7
	BFA	4440.1	.0	.0	4172.6	.0	.0	.0	.0	7582.3	.0	.0	13660.7
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	2255.4	20.0	.0	96.0	.0	.0	.0	.0	140.9	.0	.0	2427.6
	BA	28.9	.4	.0	40.5	.0	.0	.0	.0	60.5	.0	.0	104.6
TOTALS	CFA	851.7	.0	.0	998.9	.0	.0	.0	.0	1607.9	.0	.0	2834.4
	BFA	4440.1	.0	.0	4452.5	.0	.0	.0	.0	7760.5	.0	.0	13940.6
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
						PERCENT STANDARD ERROR							
	TA	32.3	100.0	.0	46.6	.0	.0	.0	.0	32.0	.0	.0	29.7
	BA	27.7	100.0	.0	22.3	.0	.0	.0	.0	20.3	.0	.0	6.3
TOTALS	CFA	27.2	.0	.0	22.1	.0	.0	.0	.0	21.6	.0	.0	7.8
	BFA	26.0	.0	.0	23.1	.0	.0	.0	.0	23.7	.0	.0	9.8

APPENDIX 5 (continued)

DISEASE SURVEY 2/ 1/83
SPECIES TOTAL

KAIBAB JACOB LAKE 7

DIAMETER CLASS		UNDAM. STAND	BUTT STEM DECAY	DWARF MISTLETOE RATING 1	2	3	4	5	6	CUR. ROOT ROT INF.	OLDER ROOT ROT MORT.	BRANCH CANKER STEM RUST	STEM CANKER	OTHER ID PROB.	OTHER DAM AGENTS	OTHER MORT	STAND TOTAL
	TA	2240.0	80.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	80.0	.0	.0	2340.0
0- 4.9	BA	.9	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.9	.0	.0	1.9
	TA	7.5	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	34.2	.0	.0	41.7
	BA	2.7	2.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	8.0	.0	.0	10.7
5- 8.9	CFA	38.7	42.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	99.9	.0	.0	138.7
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	.0	7.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.8	.0	.0	11.8
	BA	.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	6.7	.0	.0	6.7
9-11.9	CFA	.0	74.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	116.0	.0	.0	116.0
	BFA	.0	178.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	279.9	.0	.0	279.9
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	7.9	11.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	24.8	.0	.0	34.1
	BA	25.3	21.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	56.0	.0	.0	85.3
12 +	CFA	813.0	577.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	1654.1	.0	.0	2579.7
	BFA	4440.1	2885.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	8621.1	.0	.0	13660.7
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	2255.4	105.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	150.7	.0	.0	2427.6
	BA	28.9	28.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	71.6	.0	.0	104.6
TOTALS	CFA	851.7	694.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	1870.0	.0	.0	2834.4
	BFA	4440.1	3063.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	8901.0	.0	.0	13940.6
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

PERCENT STANDARD ERROR

	TA	32.3	43.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	30.3	.0	.0	29.7
	BA	27.7	30.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	15.2	.0	.0	6.3
TOTALS	CFA	27.2	32.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	16.9	.0	.0	7.8
	BFA	26.0	35.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	19.3	.0	.0	9.8

APPENDIX 5 (continued)

OTHER INSECT AND DAMAGING PROBLEM SURVEY 2/ 1/83

----------SPECIES TOTAL----------

KAIBAB JACOB LAKE 7

DIAMETER CLASS		UNDAM. STAND	SHOOT INSECT	STEM BORER	GALL INSECT	SCALES, APHID	WEB-WORMS	LIGHT WIN. DAM.	MOD. WIN. DAM.	HEAVY WIN. DAM.	ANIMAL DAM.	SPIKE TOPS	OTHER I+D PROB.	OTHER DAM. AGENTS	OTHER MORT.	STAND TOTAL
	TA	2240.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	100.0	.0	.0	2340.0
0- 4.9	BA	.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.0	.0	.0	1.9
	TA	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	34.2	.0	.0	41.7
	BA	2.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	8.0	.0	.0	10.7
5- 8.9	CFA	38.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	99.9	.0	.0	138.7
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.3	.0	11.8	.0	.0	11.8
	BA	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.3	.0	6.7	.0	.0	6.7
9-11.9	CFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	26.9	.0	116.0	.0	.0	116.0
	BFA	.0	.0	.0	.0	.0	.0	.0	.0	.0	64.0	.0	279.9	.0	.0	279.9
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	7.9	.0	.0	.0	1.5	.0	.0	.0	.0	.9	.0	26.2	.0	.0	34.1
	BA	25.3	.0	.0	.0	2.7	.0	.0	.0	.0	2.7	.0	60.0	.0	.0	85.3
12 +	CFA	813.0	.0	.0	.0	71.2	.0	.0	.0	.0	82.5	.0	1766.7	.0	.0	2579.7
	BFA	4440.1	.0	.0	.0	341.9	.0	.0	.0	.0	441.7	.0	9220.6	.0	.0	13660.7
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	TA	2255.4	.0	.0	.0	1.5	.0	.0	.0	.0	3.2	.0	172.2	.0	.0	2427.6
	BA	28.9	.0	.0	.0	2.7	.0	.0	.0	.0	4.0	.0	75.6	.0	.0	104.6
TOTALS	CFA	851.7	.0	.0	.0	71.2	.0	.0	.0	.0	109.4	.0	1982.7	.0	.0	2834.4
	BFA	4440.1	.0	.0	.0	341.9	.0	.0	.0	.0	505.7	.0	9500.6	.0	.0	13940.6
	APAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
	EPAI	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
								PERCENT STANDARD ERROR								
	TA	32.3	.0	.0	.0	100.0	.0	.0	.0	.0	75.7	.0	26.5	.0	.0	29.7
	BA	27.7	.0	.0	.0	100.0	.0	.0	.0	.0	72.4	.0	14.2	.0	.0	6.3
TOTALS	CFA	27.2	.0	.0	.0	100.0	.0	.0	.0	.0	77.7	.0	16.2	.0	.0	7.8
	BFA	26.0	.0	.0	.0	100.0	.0	.0	.0	.0	87.4	.0	18.6	.0	.0	9.8